

## 1. Caution:

- 1.1 Before wiring, please make sure that power is switched off to prevent from getting electric shock.
- 1.2 The product should be avoided to install at humid environment.
- 1.3 To prevent the controller burning out, please make sure the water-proof procedure is undertaken during installation.
- 1.4 Before supplying the power, please always check if the wiring and input power is connected correctly.
- 1.5 Please install according to the wiring diagram to avoid incorrect wiring.
- 1.6 Please always read this instruction carefully before installation. This product is beyond our warranty if any damage is caused by incorrect wiring.

## 2. Specification:

- 2.1 Displayer size: 27.8mm (H) x 68mm (L) x 15.6mm (D)  $\pm$  1mm
- 2.2 Drive board: 190mm (L) x 110mm (W) x 75mm(H)  $\pm$  1mm
- 2.3 Operating environment temperature: -5°C ~ 55°C, < 90% RH (non-condensing)
- 2.4 Storage environment temperature: -10°C ~ 65°C, < 90% RH (non-condensing)
- 2.5 Power supply: AC100 ~ 240V  $\pm$  5%, single phase 50/60Hz
- 2.6 Power consumption: Max. 2 watts (not including each output contact)
- 2.7 Temperature display range:
  - 2.7.1 -40°C ~ -20°C, 20°C ~ 70°C, accuracy  $\pm$  1°C, in 1°C step
  - 2.7.2 -19.5°C ~ 19.5°C, in 0.5°C step
  - 2.7.3 -40°F ~ 158°F, accuracy  $\pm$  2°F, in 1°F step
- 2.8 Output/ Input:
  - 2.8.1 Sensor: One set of NTC sensor, 1.5m (L)
  - 2.8.2 Compressor output contact: 1.5HP / 250VAC
  - 2.8.3 Fan output contact: 2A / 250VAC
  - 2.8.4 Alarm output: One build-in buzzer ( installed in drive board)

## 3. Function:

- 3.1 Button operation:
  - 3.1.1 In normal status (excluding E1, E3, EE, and tA), press and hold SET for 3s to enter set mode, and display parameter code "tS".
  - 3.1.2 When displaying the parameter code, press "+" or "-" to select the code, the order is tS, td, dF, dt, AU, AL, HS, LS, Ad, AC, Cr, CS, Ot, FC, dL, Ut, and OU.
  - 3.1.3 After selecting the parameter code for modification, press SET to display the parameter value, and press "+" or "-" to adjust the parameter value.
  - 3.1.4 After amending the parameter, press SET to save (memory) the value immediately and return to the page of parameter code.
  - 3.1.5 If not pressing any button within 15s or after selecting OU, it will save the amended parameter value automatically and return to display the indoor temperature.
  - 3.1.6 After selecting Ut and changing the temperature unit, the controller will reset automatically and revert to the default of the chosen unit.
  - 3.1.7 Quick setpoint mode:
    - 3.1.7.1 In normal status (excluding E1, E3, EE, and tA), press the button "-" for 3s to enter quick setpoint mode and it will display the value of setpoint(tS) with blinking.
    - 3.1.7.2 Under this mode, press the button "+" or "-" to adjust setpoint (tS) directly.
    - 3.1.7.3 If not pressing any button within 5s or pressing the button SET, it will save the parameter value automatically and to display the indoor temperature.

## 3.2 Functions:

### 3.2.1 Compressor Operation:

- 3.2.1.1 When indoor temperature  $\leq$  tS, the compressor is OFF ;  
when indoor temperature  $\geq$  ( tS + td ), the compressor is ON ;  
if it doesn't reach AC delay time, the compressor is OFF.
- 3.2.1.2 When the compressor stops operating, it will start to count AC time.
- 3.2.1.3 When power is supplied, under AC=0, the compressor will still delay 1 minute to operate.
- 3.2.1.4 Please refer to item 3.2.2 for learning about compressor operation when under defrosting.
- 3.2.1.5 Operation under failure conditions: When under E1 and EE, the compressor operates according to Cr; the compressor will operate automatically once CS terminates.

### 3.2.2 Defrost operation:

#### 3.2.2.1 Defrost cycle:

- 3.2.2.1.1 When power is supplied, it begins to countdown the defrost cycle.  
( Ex. dF = 6, it will defrost every 6 hours, and 4 times one day.)
- 3.2.2.1.2 When it reaches (dF - dt), it begins defrosting (defrost automatically);  
however, if it is under defrosting by manual at that time, defrost period (dt) will not be recounted.
- 3.2.2.1.3 Defrost by manual (in normal status, press the button "+" and "-" for 3s simultaneously), it will manually enter / terminate defrosting without affecting its cycle.
- 3.2.2.1.4 Once it occurred failure or alarm, it won't affect to compute defrost cycle.
- 3.2.2.1.5 After changing dF, it will load a new parameter value from next defrost cycle. If changing the value before entering automatic defrost (dt), dt will take effect immediately; if changing the value during automatic defrost, it will take effect from next cycle.

#### 3.2.2.2 Defrost mode (Compressor is off )

- 3.2.2.2.1 When it is ready for defrosting, dt (defrost period) begins to countdown; compressor is OFF and fan is ON.
- 3.2.2.2.2 Defrost is finished when dt is done.

#### 3.2.2.3 Defrost termination:

- 3.2.2.3.1 When dt is completed, it will return to operation mode and the compressor is OFF.

#### 3.2.2.4 Indoor temperature lockup ( dL ):

- 3.2.2.4.1 When dL = 0, cabinet temp. shows normally during defrost period.
- 3.2.2.4.2 When dL = 1, under defrosting period, indoor temp. on display will be fixed; when defrosting has completed, and the indoor temp.  $\leq$  setpoint ( tS ), current cabinet temperature will begin to be displayed.

### 3.2.3 Fan operation:

- 3.2.3.1 During defrosting, fan output will be ON.
- 3.2.3.2 Under E1 and EE status, fan output will be ON constantly ( LED is ON ).
- 3.2.3.3 When fan mode is FC = 0, fan output will be ON (LED is ON) / OFF (LED is OFF) according to compressor.
- 3.2.3.4 When fan mode is FC = 1, fan output will be ON ( LED is ON ) constantly.

### 3.2.4 Parameter memory:

- 3.2.4.1 When power failure happens during operation, the controller will operate according to previous parameter values after power is supplied again.  
(The memory is not including defrosting status / cycle).

### 3.2.5 Indoor temp. calibration : Indoor temp. display = Indoor temp. + Temp. calibration (Ot).

### 3.2.6 Alarm:

3.2.6.1 When cabinet temp. is higher than AU( UA and cabinet temp. are displayed alternately ) or cabinet temp. is lower than AL ( LA and cabinet temp. are displayed alternately ) , it will start to countdown alarm delay time; when delay period is completed, alarm will be enabled.  
(Conditions:after power is supplied, and indoor temp. reaches the setpoint at least one time, alarm function would be enabled.)

### 3.2.7 Setpoint protection:

3.2.7.1 To adjust HS / LS and limit the Max./ Min. setpoint range so as to prevent the setpoint is higher than that the compressor can operate, or avoid the temp. is over high due to mistake setting.

### 3.2.8 Circuit board protection:

3.2.8.1 When circuit board temp.  $\geq 95^{\circ}\text{C}$  or display E3, the controller will disable output contacts compulsively, show "tA" or "E3" with blink, and enable alarms : once the circuit board temp.  $\leq 75^{\circ}\text{C}$ , "tA" will be released.

### 3.2.9 Alarm output (Buzzer):

3.2.9.1 When displaying UA and LA, it starts to count down Ad and alarm is enabled once Ad is completed.

3.2.9.2 When it happened to failure ( E1, E3, and EE ) or circuit board protection ( tA ), alarm is enabled immediately.

3.2.9.3 When alarm is performed, press " – " to cancel its output temporarily, and to press " – "again to start its output if the failure / warning doesn't be eliminated.

### 3.3 LED indicators:

#### 3.3.1 "❄️" Cooling indicator

3.3.1.1 The LED is illuminated constantly when the compressor is operating.

3.3.1.2 The LED is blinking when the compressor is in delay protection.

3.3.1.3 The LED is off when the compressor is in stand-by status.

#### 3.3.2 "❄️" Defrost indicator

3.3.2.1 The LED is illuminated constantly when under defrosting.

#### 3.3.3 "🌀": The LED is illuminated constantly when fan output is in the action.

### 3.4 Parameter lockup:

3.4.1 In normal status ( excluding E1 and EE ), press the button "SET" and " – " simultaneously and keep holding 3s, except the setpoint "tS", it will lock / unlock the setting parameter.

3.4.2 Displaying " LC " means parameter has been locked.

3.4.3 Displaying " UL " means parameter has been unlocked.

3.4.4 Parameter lockup will not be affected if power failure happens; after power restoration, it will read the locked status automatically according to its memory.

### 3.5 Failure / Alarm:

3.5.1 When cabinet probe failure, "E1" blinks, it will perform the fault operation.

3.5.2 When circuit board probe failure, "E3" blinks, and it will shut down the output contact.

3.5.3 When memory failure, "EE" blinks, and it will revert to default value and perform the fault operation; if "EE" can't be eliminated after reboot, that means the memory is broken.

3.5.4 When communication happens error, "EC" blinks; if the controller is well operation, it can operate as usual.

3.5.5 High temp. alarm, it shows "UA" and displays alternately with indoor temperature.

3.5.6 Low temp. alarm, it shows "LA" and displays alternately with indoor temperature.

3.5.7 Alarm for circuit board, "tA" will be blinking and shut down the output contact.

3.6 Restore default value: press the button "+" and " – " simultaneously before power is supplied to restore default values, after displaying "rS" for 3s, it will reset automatically and reboot soon after.

## 4. Parameter List

Code	Function	Range		Default	Unit	Description
		Min	Max			
tS	Setpoint	LS	HS	4 40	$^{\circ}\text{C}$ $^{\circ}\text{F}$	Compressor stops when it reaches the setpoint.
td	Temp. Differential	0.5 1	10 20	4 8	$^{\circ}\text{C}$ $^{\circ}\text{F}$	Compressor will start to operate when the temp.=tS + td
dF	Defrost cycle	0	99	6	hr	Set the interval between defrost cycles ( dF=0, it won't defrost automatically, but it can defrost by manual.)
dt	Defrost period	1	55	30	min	Defrost duration is subject to the present defrost time. Defrost is terminated when defrost time is enough.
AU	Max. temp for alarm	AL+1	70 158	45 113	$^{\circ}\text{C}$ $^{\circ}\text{F}$	Cabinet temp. $\geq$ AU, alarm will be enabled. ( Start conditions: Cabinet temp. must reaches the setpoint once.)
AL	Min. temp for alarm	-40	AU-1	-40	$^{\circ}\text{C}$ $^{\circ}\text{F}$	Cabinet temp. $\leq$ AL, alarm will be enabled. ( Start conditions: Cabinet temp. must reaches the setpoint once.)
HS	Max. Setpoint	tS	60 140	25 79	$^{\circ}\text{C}$ $^{\circ}\text{F}$	To limit the max. setpoint.
LS	Min. Setpoint	-40	tS	-30 -20	$^{\circ}\text{C}$ $^{\circ}\text{F}$	To limit the min. setpoint.
Ad	Alarm delay	0	60	15	min	When alarm is performed, the delay time of buzzer output.
AC	Compressor delay Protection	0	30	1	min	Interval time between compressor stop and restart as a protection.
Cr	Compressor operation period under any failure	0	60	15	min	The time of compressor is enforced to operate when under EE, E1, and EC. ( When Cr = 0, compressor is always off.)
CS	Compressor termination period under any failure	0	60	15	min	The time of compressor is enforced to terminate when under EE, E1, and EC. ( When Cr = 0, compressor is always on.)
Ot	Temp. Calibration	-12 -24	12 24	0	$^{\circ}\text{C}$ $^{\circ}\text{F}$	Indoor temp. display = Indoor temp. + Temp. Calibration
FC	Fan mode	0	1	1	-	0 : fan operates according to compressor; 1 : fan operates continuously.
dL	Indoor temp. Lockup	0	1	0	-	0 : cabinet temp. shows normally during defrost period; 1 : cabinet temp. is locked and fixed during defrost period.
Ut	Temp. Unit	$^{\circ}\text{C}$	$^{\circ}\text{F}$	$^{\circ}\text{C}$	-	After setting or changing the temp. unit, and showing rS, it will reboot automatically.
OU	Exit	-	-	-	-	Exit setting mode.